ISBN 0-7729-2335-3

STANDARDS DEVELOPMENT BRANCH OMOE
36936000003981

FINAL REPORT

AIR QUALITY SURVEY
LEES AVENUE & NAVRO SITES
OTTAWA
MAY, JUNE & SEPTEMBER, 1986

ARB-041-87-AQM

APRIL, 1987

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1987
MOE

Ministry
of the
Environment
Ontario

E. PICHÉ, Director
Air Resources Branch

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PREPARED FOR THE
SOUTHEASTERN REGION
MINISTRY OF THE ENVIRONMENT

BY R. E. CHAPMAN

AIR QUALITY and METEOROLOGY SECTION
AIR RESOURCES BRANCH
MINISTRY OF THE ENVIRONMENT

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Results Tables for September, 1986.

1.0 SOMMAIRE

La station du couloir de transport en commun de l'AVENUE LEES, à Ottawa, est située là où se trouvait autrefois une usine de gazéification du charbon qui a cessé de fonctionner vers le milieu des années 1950 et qui a été démolie à la fin de la décennie suivante. En avril 1986, la présence d'une matière semblable à du goudron a été signalée dans la rivière Rideau, non loin de là, et l'on a établi que la matière en question provenait de l'égout pluvial relié à la station de pompage de l'AVENUE LEES.

Pendant l'enquête que plusieurs cabinets d'experts-conseils en matière d'environnement ont menée sur la nature et l'ampleur du problème, une unité mobile de surveillance de l'air (MAMU # 2) relevant de la Direction des ressources atmosphériques d'Environnement Ontario a effectué à plusieurs endroits clefs des mesures pour évaluer la qualité de l'air : le secteur de la station du couloir de transport en commun; les sous-sols de plusieurs immeubles d'habitation de l'AVENUE LEES; l'installation NAVRO de recyclage des déchets, qui a éliminé les déchets recueillis aux premiers stades de l'opération de nettoyage; et l'école Notre-Dame-Des-Champs située à environ 200 mètres de l'usine NAVRO, dans la ville de Gloucester.

Il n'est jamais arrivé pendant l'enquête que les niveaux des divers composés organiques décelés dépassent ou même atteignent les normes ou les lignes directrices établies par l'Ontario.

À la station de l'AVENUE LEES, on n'a observé que de faibles concentrations de contaminants, sauf au-dessus ou à côté des ouvertures de l'égout pluvial. Les concentrations de composés aromatiques (benzène, toluène, xylène et leurs dérivés) étaient alors anormalement élevées, mais elles étaient encore inférieures aux normes de l'Ontario. Les niveaux des résidus totaux de soufre réduit et d'oxydes d'azote étaient excessifs à certains moments, sans doute à cause d'une pompe située à proximité.

Dans les sous-sols de plusieurs immeubles d'habitation de l'AVENUE LEES, on n'a décelé que des contaminants propres aux gaz d'échappement des véhicules, sauf dans l'immeuble vacant sis au 169 de l'AVENUE LEES, où l'on a relevé un taux relativement élevé de dérivés aromatiques et de nombreux composés non identifiés.

À l'usine NAVRO, les niveaux de toluène étaient assez importants pour qu'on note une odeur aromatique assez forte en bordure de la propriété, mais ils étaient bien inférieurs à la norme des 30 minutes.

Les mesures effectuées sur les terrains de l'école en juin ont révélé la présence de très faibles concentrations de contaminants.

1.0 SUMMARY

The LEES AVENUE transitway station in Ottawa is on the former site of a coal-gasification plant which ceased operations in the mid-1950s and was demolished in the late 1960s. In April 1986 a tar-like material was reported in the Rideau River nearby and was traced to a storm sewer connected to the LEES AVENUE transitway pumping station.

During the investigation into the nature and extent of the problem, which was carried out by several environmental consulting firms, a mobile air monitoring unit (MAMU#2) from the Air Resources Branch of Environment Ontario performed air quality measurements in several areas of concern: the transitway station area; indoor basement areas of several LEES AVENUE apartment buildings; the NAVRO waste recycling facility which disposed of the waste material from the initial part of the clean-up; and the Notre-Dame Des Champs school approximately 200 metres from the NAVRO site in the City of Gloucester.

None of the Ontario standards or guidelines for any of the monitored organic compounds were exceeded or approached at any time during the survey.

The transitway station area showed low contaminant concentrations except when sampled above or beside openings to the storm sewer system. At those times, concentrations of aromatic compounds (benzene, toluene and xylenes and derivatives) were abnormally high but still below the Ontario standards. Levels of total reduced sulphur and nitrogen oxides were excessive at certain times, probably influenced by a nearby pump.

The indoor basement areas of several LEES AVENUE apartment buildings showed only vehicle emission contaminants, except for the vacant building at #169 LEES AVENUE which showed a fairly

large proportion of aromatic derivatives and a large number of unidentified compounds.

The NAVRO property showed toluene levels large enough for a fairly strong aromatic odour at the property line but well below the ½-hour standard.

Measurements on the school property in June showed very low contaminant concentrations.

2.0 INTRODUCTION

The LEES AVENUE transitway station in Ottawa is on the former site of a coal-gasification plant which ceased operations in the mid-1950s and was demolished in the late 1960s. In April 1986 a tar-like material was reported in the Rideau River nearby and was traced to a storm sewer connected to the LEES AVENUE transitway pumping station.

During the investigation into the nature and extent of the problem, as carried out by several environmental consulting firms, a mobile air monitoring unit (MAMU#2) from the Air Resources Branch of Environment Ontario performed air quality measurements in several areas of concern: the transitway station area; indoor basement areas of several LEES AVENUE apartment buildings; the NAVRO waste recycling facility which disposed of the waste material from the initial part of the clean-up; and the Notre-Dame Des Champs school approximately 200 metres from the NAVRO site in the City of Gloucester.

3.0 MAMU#2

The MAMU#2 is a self-contained mobile laboratory equipped with advanced analytical instrumentation and dedicated to ambient air monitoring. The classical pollutants measured routinely are nitrogen oxides (NO_X), sulphur dioxide (SO_2), carbon monoxide (CO), total reduced sulphur (TRS), ozone (O_3) and total hydrocarbons (THC).

Many specific hydrocarbons were identified by using a gas chromatograph (GC) coupled to a hydrocarbon preconcentrator of our own design. Ambient air was drawn through a glass cartridge containing absorbent material for 30 minutes. Trapped contaminants were thermally desorbed, prefocused and cryo-trapped at the GC column head. The sample was analyzed by two columns of different polarities and standard flame-ionization detectors. Compounds detectable by the GC-preconcentrator system include alkanes, alkenes, alkynes, aromatics and chlorinated hydrocarbons. Typical detection limits are in the 0.1-1 ug/m^3 range.

Temperature, wind speed and wind direction are the most important meteorological parameters that were measured during the sampling periods.

4.0 RESULTS

4.1 May - June, 1986

LEES AVENUE - See Figure 1

The concentrations of the classical pollutants and the organic (hydrocarbon) contaminants were generally low, even on the transitway station property, except for three periods above or beside openings to the storm sewer system (on transitway property). The wet well opening in the station pumphouse produced a total hydrocarbon level of 600 ug/m³ with a 60% alkanes/30% aromatics distribution that is typical of vehicle emissions - evaporative and exhaust. The manhole opening in the northbound lane at the lowest point of the transitway provided the largest hydrocarbon levels - approximately 2500 ug/m³ for each of two samples and roughly a 30% alkanes/60% aromatics split - including benzene, toluene and xylene levels (aromatics) that were too high for just vehicle emissions from the passing buses (sampling site 3).

In addition, for the open manhole area, the level of total reduced sulphur (TRS) was always above the guideline presently in use, 0.027 ppm for a ½-hour average near a kraft pulp mill (odour is the limiting effect). The maximum ½-hour average concentration of TRS was 0.070 ppm, up slightly from the normal level of 0.060 ppm because a pump was activated 40 metres away in a connecting sewer line halfway through the monitoring period.

The violent agitation of the underground water probably released more reduced sulphur compounds and may also explain the increased levels of aromatics for the second GC sampling period. The NO_X standard was exceeded after the pump was started, likely due to the pump motor's exhaust.

NAVRO/Notre-Dame Des Champs School - See Figure 2.

The first samples in this area were taken on May 31 at the eastern fenceline of the NAVRO site, approximately 40 metres downwind of the storage tanks area. The THC level was relatively high (3710, 4741 ug/m³) with a 60% alkanes/30% aromatics distribution. One-half of the aromatics was represented by a toluene in concentrations greater than 700 ug/m³, producing a fairly strong aromatic odour but well below the ½-hour standard of 2000 ug/m³.

On June 1 two air samples were analyzed on the school property, approximately 200 metres west of the NAVRO site, during a period of northerly winds. As expected for this wind direction the hydrocarbon concentrations were very low (274, 46 ug/m^3: the higher result of 274 ug/m^3 may have been a "residual" effect in the instrumentation due to the preceding sampling period at the transitway manhole area).

The school property samples were immediately followed by two samples on the main road downwind of the NAVRO site. Approximately 100 metres from the storage tanks area there was an infrequent, faint aromatic odour. The total hydrocarbons were 10-15% of the previous NAVRO results at 40 metres range, including alkanes at 5% of the previous result and aromatics at 20%. Since the ambient temperature was 10 Celsius degrees cooler than the previous day the larger percentage loss of the alkanes (compared to the aromatics) was probably due to the lower boiling points of many alkanes (near ambient temperature) and the concomitant greater sensitivity of their vapour pressures to ambient temperature changes.

4.2 September, 1986

On September 4, while the mobile laboratory MAMU#2 was at the Main Street Community Centre for an open house concerning the LEES AVENUE coal tar cleanup, air samples were gathered from the basement areas inside of several LEES AVENUE apartment buildings and from the pumping station and NAVRO sites as well. Two 30-minute samples were collected at each site and the results of the gas chromatography analyses are attached here after consideration of the mass selective detector (MSD) analysis also done for each sample.

169 LEES AVENUE

The building was vacant (never occupied) and samples were collected on a lower level, in a small sump pump room, near a hydro room, at the edge of a hole in the floor; no odour was detected.

The results for this building are different from the other buildings' results, probably due to the lack of vehicle emissions (alkanes) in a vacant building. The aromatic class was largest and consisted mainly of the substituted benzene and toluene compounds; however, the absence of benzene and toluene is not easily explained. This building's results also had the lowest percentage of identified peaks and area in the GC chromatogram.

170 LEES AVENUE

The samples were collected inside the building, on the third level down (not used) at parking spot #102, five feet from a tarry substance at a crack in the floor; no odour was detected.

Analysis showed very clean air samples.

180 LEES AVENUE

The samples were collected inside the building, on the second level down (used parking area), near sump pumps in a room beside the elevators; no odour was detected.

The relatively high level of total hydrocarbons, 60% alkanes, is probably due to vehicle emissions - evaporative and exhaust.

190 LEES AVENUE

Samples were collected inside the building, in a used lower level parking area, ten feet from sump pumps; no odour.

Although the concentrations are only one-half of those for #180 LEES AVENUE, the compound pattern is highly similar and indicates vehicle emissions.

PUMP STATION

Samples were collected near the top of the wet well in the pumping station on transitway station property; no odour.

Analysis showed very clean air samples.

NAVRO SITE

Samples were collected on NAVRO property, in the middle of the driveway (15 feet from the east fence), adjacent to stacked barrels; the site was inactive during sampling.

Analysis showed relatively clean air samples with nothing unusual found.

5.0 CONCLUSIONS

Concentrations of all contaminants were generally low on the LEES AVENUE transitway station property except for three periods above or beside openings to the storm sewer system. One period indicated vehicle emissions and two periods - in the northbound lane at the lowest point of the transitway - showed aromatic levels too high for just vehicle emissions. However, TRS and NO_x were the only compounds to exceed Ontario standards or guidelines, and those exceedences were probably due to a pump operating nearby.

The LEES AVENUE apartment buildings generally showed only vehicle emissions in their basement garages. Only the vacant building at #169 LEES AVENUE was different and showed an absence of benzene and toluene but a fairly large proportion of substituted benzene and toluene compounds (aromatics). A large number of compounds were detected at #169 but not identified.

Measurements taken close to the NAVRO property in May showed toluene levels large enough for a fairly strong aromatic odour but well below the ½-hour standard. No other compounds were seen in levels approaching standards or guidelines. Measurements in September showed relatively clean air on NAVRO property.

Measurements on the Notre Dame des Champs School property in June showed very low hydrocarbon concentrations.

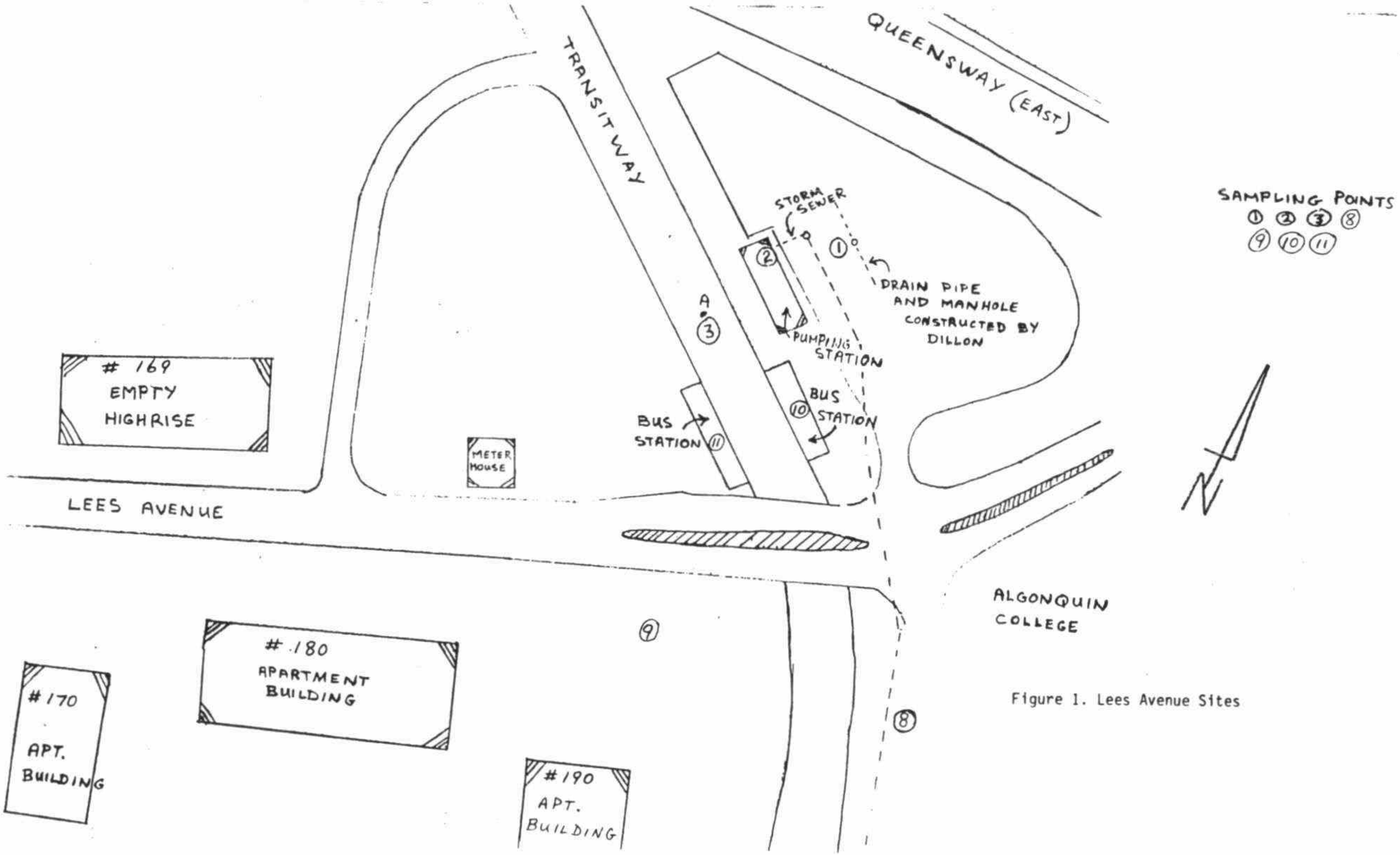

Figure 1. Lees Avenue Sites

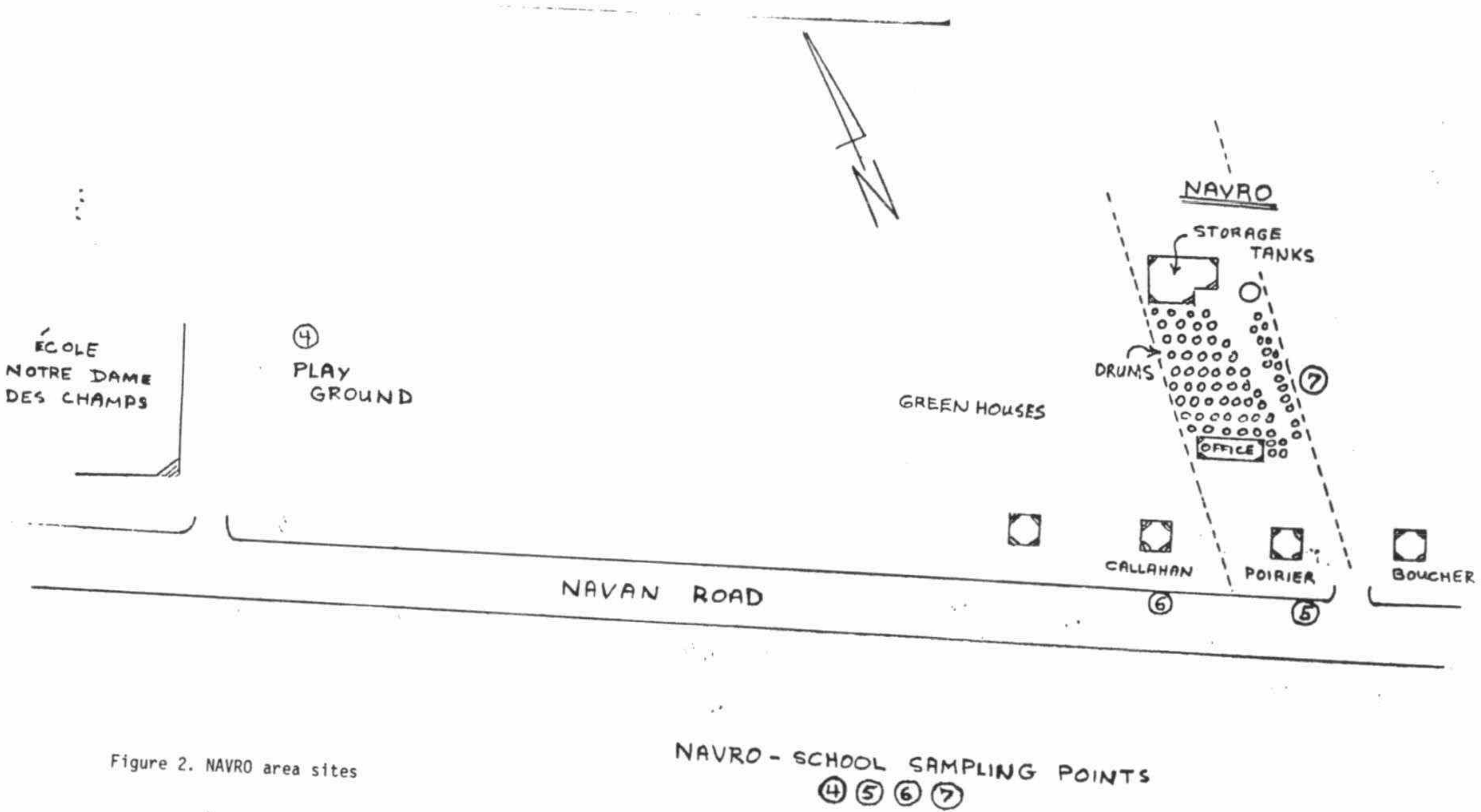

Figure 2. NAVRO area sites

Approx. scale: 1"= 30 metres

LOCATION	LEES AVENUE STATION PROPERTY				NAVRO FENCELINE		LEES AVENUE OPEN MANHOLE		SCHOOLYARD NEAR NAVRO		NAVRO - AT ROAD		ALG.COLL. PARK. LOT	190 LEES FRONT LOT	LEES AVENUE STATION ELEVATOR AREA				
															E.SHAFT	W.SHAFT	TOP E.ELEV	E STAIRS	W STAIRS
MAP I.D.	1	1	1	2	7	7	3	3	4	4	5	6	8	9	10	11	10	10	11
	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986
	MAY 31	MAY 31	MAY 31	MAY 31	MAY 31	MAY 31	JUN 1	JUN 1	JUN 1	JUN 1	JUN 1	JUN 1	JUN 2	JUN 2	JUN 2	JUN 2	JUN 3	JUN 3	JUN 3
	12:25	13:34	14:45	16:02	18:24	18:58	12:12	13:02	15:12	16:11	17:02	17:58	12:14	14:54	16:13	16:56	15:51	16:53	17:30
15 ETHANE																			
16 PROPANE	1.42	1.30	1.45	2.43	30.21	15.02	25.76		1.11	0.75	0.97	1.12	2.18	2.99	9.98	44.88	10.54	12.70	8.67
17 PROPADIENE								1.67											
18 PROPYNE		0.29		0.38				2.14											
19 CHLOROMETHANE																			
20 CYCLOPROPANE																			
21 2-METHYLPROPANE	1.88	1.70	2.74	15.39	151.78	173.04	17.74	18.38	5.08		3.01	1.28	1.32	11.10	3.00	2.29	3.13	1.06	2.05
22 CHLOROETHENE																			
23 1-BUTENE				6.25	42.47	45.13	8.76	19.98	2.63		2.20		1.03	3.32	1.79	1.66			1.24
24 1,3-BUTADIENE																			
25 BUTANE	5.93	5.90	9.12	55.84	540.29	568.08	80.64	66.21	24.08	2.06	12.57	4.62	4.20	38.78	10.35	8.05	10.36	2.64	6.10
26 1-BUTYNE																			
27 CHLOROETHANE																			
28 3-METHYL-1-BUTENE		0.61		1.82	13.47	13.68	4.25	4.04						1.22					
29 2-METHYLBUTANE	5.84	30.86	9.69	73.12	506.40	512.29	191.58	107.93	55.63	5.07	22.71	8.30	5.03	46.84	14.38	9.48	7.97	2.54	6.59
30 1-PENTENE	0.33	1.14	0.48	3.65	20.79	21.03	7.61	5.52	2.14		0.91			2.05					
31 PENTANE	4.00	13.98	6.45	56.03	306.89	326.94	146.77	80.79	40.68	4.84	16.71	6.91	3.39	29.20	10.21	16.24	5.95	1.77	4.89
32 2-METHYL-1,3-BUTADIENE		1.14		1.11	3.36	3.56		6.46			0.92		1.33	1.63					
33 TRANS-2-PENTENE	0.59	0.64	0.83	4.94	32.78	32.71	14.91	8.19	4.05	0.64	1.51	0.84	0.38	3.19	1.20	0.95	0.76		0.64
34 CIS-2-PENTENE	0.26	0.44	0.39	2.94	18.79	18.77	8.10	4.67	2.16		0.84			1.83					
35 DICHLOROMETHANE					52.24	213.39					38.07	62.76							
36 2-METHYL-2-BUTENE	0.50	1.10	0.89	7.87	56.65	57.27	27.51	15.59	6.90	0.78	2.63	1.11	0.63	5.33	1.75	1.26	1.20		0.87
37 3-CHLOROPROPENE						2.91													
38 2,2-DIMETHYLBUTANE		3.43	0.45	3.06	12.87	17.44	5.31	3.37	1.39		0.92	0.68		1.08					
39 2-CHLORO-2-METHYLPROPANE																			
40 TRANS-1,2-DICHLOROETHENE																			
41 4-METHYL-1-PENTENE																			
42 3-METHYL-1-PENTENE																			
43 CYCLOPENTANE	0.90	2.05	1.47	5.61	24.43	142.04	14.27	8.34	3.95	0.96	1.86	1.63	0.53	2.63	1.62	0.98	1.11		0.68
44 2,3-DIMETHYLBUTANE	0.88		0.97	4.55	25.22	155.17	15.56	9.34	4.14	0.77	1.99	1.60	0.60	2.84	1.72	1.00	1.02		0.73
45 2-METHYLPENTANE	2.66	2.87	4.09	26.27	127.23	152.45	74.49	52.32	18.54	3.81	10.42	6.69	2.29	14.02	6.29	4.29	3.66	1.37	3.33
46 3-METHYLPENTANE	1.51	1.49	2.42	16.87	82.74	99.29	55.10	35.36	13.48	2.53	7.36	4.72	1.46	9.06	4.92	2.86	2.42	0.97	2.22
47 1-HEXENE				1.34	5.87	5.79	3.77	3.08	0.95					0.78					
48 cis-1,2-DICHLOROETHENE																			
49 2-CHLOROBUTANE				2.19	9.61	9.37	7.01												
50 HEXANE	2.32	2.21	3.75	27.05	113.37	155.43	86.21	60.05	21.41	4.89	12.21	10.47	2.74	13.57	7.78	4.10	3.74	1.48	3.23
51 TRICHLOROMETHANE																			
52 TRANS-3-HEXENE				0.93	4.37	4.82	3.61	2.42	1.34			1.34		0.78					
53 3-CHLORO-2-METHYLPROPENE																			
54 METHYLCYCLOPENTANE	1.14	1.04	1.70	12.96	47.96	61.91	39.45	29.01	9.40	2.10	5.03	3.30	1.11	6.40	3.76	2.09	1.87	0.59	1.58
55 1,2-DICHLOROETHANE																			
56 1,1,1-TRICHLOROETHANE					19.99	47.53					9.75	8.54							
57 1-CHLOROBUTANE																			
58 BENZENE	3.43	22.54	4.27	61.01	47.40	188.99	376.57	577.27	7.70	2.80	4.94	4.26	2.67	6.56	5.03	4.18	2.66	1.54	2.42
59 TETRACHLOROMETHANE					16.80														
60 CYCLOHEXANE	0.29	0.41	0.49	4.13	13.53	22.11	12.37	10.25	2.62	0.66	2.06	1.71	0.33	1.89	1.21				
61 2-METHYLHEXANE	0.75		1.30		24.58			15.80	3.84	1.13	5.02	5.98	0.78	3.32	2.74	1.62	1.89		1.18
62 2,3-DIMETHYLPENTANE			0.57	2.60	8.32	14.39	5.84	5.28	1.49		1.98	2.33		1.31					

LOCATION	LEES AVENUE STATION PROPERTY				NAVRO FENCELINE		LEES AVENUE OPEN MANHOLE		SCHOOLYARD NEAR NAVRO		NAVRO - AT ROAD		ALG.COLL. PARK. LOT	190 LEES FRONT LOT	LEES AVENUE STATION ELEVATOR AREA				
															E.SHAFT	W.SHAFT	TOP E.ELEV	E STAIRS	W STAIRS
MAP I.D.	1	1	1	2	7	7	3	3	4	4	5	6	8	9	10	11	10	10	11
	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986
	MAY 31	MAY 31	MAY 31	MAY 31	MAY 31	MAY 31	JUN 1	JUN 1	JUN 1	JUN 1	JUN 1	JUN 1	JUN 2	JUN 2	JUN 2	JUN 2	JUN 3	JUN 3	JUN 3
	12:25	13:34	14:45	16:02	18:24	18:58	12:12	13:02	15:12	16:11	17:02	17:58	12:14	14:54	16:13	16:56	15:51	16:53	17:30
63 CYCLOHEXENE																			
64 3-METHYLHEXANE	0.81	0.84	1.45	6.57	26.55	42.05	16.91	16.51	3.83	1.14	6.05	7.47	0.84	3.49	2.98	1.82	2.18	0.62	1.27
65 DIBROMOMETHANE																			
66 1,2-DICHLOROPROPANE																			
67 2,3-DICHLOROPROPENE																			
68 TRICHLOROETHENE											9.92	20.63							
69 1-HEPTENE			0.46	2.53	10.75	16.20	6.42	6.43	1.52		2.13	2.59		1.39	1.15				
70 2,2,4-TRIMETHYLPENTANE	0.77	0.69	0.90	3.91			7.89	8.13	1.84		1.89	2.26	0.74	1.82	1.90	1.57	1.05		0.87
71 HEPTANE	0.83	0.83	1.38	4.91	24.32	41.99	12.54	13.00	2.91	1.15	6.63	8.76	0.83	3.26	2.95	1.96	1.99	0.75	1.22
72 1-CHLORO-3-METHYLBUTANE							1.61												
73 TRANS-2-HEPTENE				0.40															
74 METHYLCYCLOHEXANE	0.45	0.48	0.82	3.84	26.91	57.26	8.38	9.41	2.00		9.50	15.75	0.48	2.20	2.77	1.55	2.34		0.71
75 2,5-DIMETHYLHEXANE						10.35					1.48	2.56							
76 4-METHYLCYCLOHEXENE																			
77 1-CHLOROPENTANE				1.00	5.36	6.77	1.82					1.09		0.80					
78 1,1,2-TRICHLOROETHANE																			
79 TOLUENE	5.06	5.53	7.30	19.72	772.40	704.82	378.85	481.25	7.23	3.44	107.97	149.34	4.63	10.24	13.15	8.87	20.30	3.23	4.86
80 1,3-DICHLOROPROPANE																			
81 2-METHYLHEPTANE	0.30	0.37	0.63	2.58	15.11	42.14	7.56	10.82	0.95		6.84	11.84	0.39	1.34	1.61		1.45		
82 4-METHYLHEPTANE					3.43						1.43								
83 3-METHYLHEPTANE	0.42	0.42	0.84	2.74	15.51	41.92	4.59	7.08	0.95		6.64	11.10	0.45	1.43	1.65		1.54		
84 1,2-DIBROMOETHANE																			
85 1-OCTENE																			
86 TRANS-4-OCTENE																			
87 2-METHYL-1-HEPTENE																			
88 OCTANE	3.34	11.41	2.37	15.05	14.99	40.07	5.66	6.02	2.17	0.88	4.75	9.35	0.99	1.62	1.84		1.71		
89 TRANS12DIMETHYLCYCLOHEXAN	3.68	11.00	2.61	16.54	16.39	43.75	5.52	6.58	2.38	0.97	6.10	11.76	1.09	1.78	2.01		1.88		
90 TETRACHLOROETHENE																			
91 2-OCTENE																			
92 PROPYLCYCLOPENTANE																			
93 CIS12DIMETHYLCYCLOHEXANE																			
94 CHLOROBENZENE																			
95 ETHYLCYCLOHEXANE				0.75	3.96	12.96					1.89	3.65							
96 1-CHLOROHEXANE																			
97 ETHYLBENZENE	1.04	1.73	2.22	4.88	54.35	95.70	61.04	93.29	1.32		16.59	28.59	0.98	2.00	2.52	1.54	1.32		0.92
98 M&P-XYLENES	3.34	6.42	7.15	15.73	175.48	308.93	164.25	226.89	4.16	2.24	50.48	86.76	3.07	6.14	8.29	4.73	4.06	1.86	2.83
99 4-METHYLOCTANE			0.56	1.41	5.70			3.27			2.33	4.09		0.60			0.84		
100 2-METHYLOCTANE				1.39	5.61			3.20			2.29	4.02		0.59			0.83		
101 3-METHYLOCTANE																	0.67		
102 STYRENE		0.57	1.10	1.91	3.23	13.80	112.85	117.43											
103 1,4-DICHLOROBUTANE				1.57															
104 1,1,2,2-TETRACHLOROETHANE																			
105 O-XYLENE	1.28			5.88	44.90	69.85	75.45	101.08	1.46	0.77	12.36	20.58	1.15	2.16	3.08	1.92	1.48	0.71	1.12
106 1-NONENE				0.60	2.45	5.92						1.54							
107 1,2,3-TRICHLOROPROPANE																			
108 TRANS-1,4-DICL-2-BUTENE						8.31													
109 NONANE	0.54	0.63	0.89	2.17	8.83	15.19	4.26	8.05			2.79	4.61	0.56	0.82	2.55		1.85		
110 ISOPROPYLBENZENE				1.11		2.75	2.01	2.72											
111 2-CHLOROTOLUENE																			

							LEES AVENUE		SCHOOLYARD				ALG.COLL.	190 LEES	LEES AVENUE STATION ELEVATOR AREA				
LOCATION	LEES AVENUE STATION PROPERTY				NAVRO FENCELINE		OPEN MANHOLE		NEAR NAVRO		NAVRO - AT ROAD		PARK. LOT	FRONT LOT	E.SHAFT	W.SHAFT	TOP E.ELEV	E STAIRS	W STAIRS
MAP I.D.	1	1	1	2	7	7	3	3	4	4	5	6	8	9	10	11	10	10	11
	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986
	MAY 31	MAY 31	MAY 31	MAY 31	MAY 31	MAY 31	JUN 1	JUN 1	JUN 1	JUN 1	JUN 1	JUN 1	JUN 2	JUN 2	JUN 2	JUN 2	JUN 3	JUN 3	JUN 3
	12:25	13:34	14:45	16:02	18:24	18:58	12:12	13:02	15:12	16:11	17:02	17:58	12:14	14:54	16:13	16:56	15:51	16:53	17:30
112 3-CHLOROTOLUENE																			
113 PROPYLBENZENE		1.13	1.02			4.49	2.35	3.95			1.02	1.46		0.53					
114 4-CHLOROTOLUENE																			
115 3-ETHYLTOLUENE	1.12	3.28	3.06	5.90	11.85	11.78	14.32	24.96	1.16		2.24	3.23	0.99	1.72	2.70	1.62	1.32		1.16
116 4-ETHYLTOLUENE			1.83		4.24	5.77	7.25	8.76	0.98			1.52	0.63	0.83					
117 1,3,5-TRIMETHYLBENZENE	0.99	2.88	2.95	4.55	9.18	9.14	20.06	33.52			2.00	2.61	0.82	1.31	0.94				
118 2-ETHYLTOLUENE		1.49	1.42	2.11	4.35	3.83	5.12	7.36				1.02		0.63					
119 1-DECENE																			
120 tert-BUTYLBENZENE										0.88				1.83					
121 1,2,4-TRIMETHYLBENZENE	1.63	6.49	6.20	9.96	16.43	13.90	58.60	80.47	1.78	0.96	2.94	3.74	1.43	1.98	2.75	1.63			1.30
122 1,5-DICHLOROPENTANE																			
123 1,3-DICHLOROBENZENE				9.77															
124 TERTBUTYLCYCLOHEXANE	0.48	1.12	1.18	3.86									0.40						
125 (CHLOROMETHYL)BENZENE																			
126 DECANE	1.13	1.88	2.33	8.33	20.18	12.88	7.27	13.79			3.18	3.75	1.05	0.82	4.84		3.24	1.30	1.51
127 ISOBUTYLBENZENE																			
128 3-(CHLOROMETHYL)HEPTANE																			
129 SEC-BUTYLBENZENE																			
130 1,2,3-TRIMETHYLBENZENE	0.90	3.52	3.46	4.51	8.49	6.73	29.73	36.27			1.44	1.64	0.66	0.88	2.39				
131 1ISOPROPYL4METHYLBENZENE				0.65					0.95										
132 1,2-DICHLOROBENZENE																			
133 INDAN		1.25	1.22	1.60			11.71	14.82											
134 BUTYLCYCLOHEXANE																			
135 1,3-DIETHYLBENZENE																			
136 1,4-DIETHYLBENZENE																			
137 BUTYLBENZENE	0.52	2.51	2.27	4.10	6.05	2.95								0.62					
138 1,2-DIETHYLBENZENE				1.90															
139 T-DECALIN																			
140 UNDECANE	2.28	5.45	6.65	9.21	27.10	8.35	20.00	30.39			2.41	3.11	1.83	1.06	8.30		3.14	3.07	5.04
141 C-DECALIN							3.52	5.00											
142 1235-TETRAMETHYLBENZENE		4.42	4.49	6.16			13.33	19.26											
143 1234-TETRAMETHYLBENZENE								19.28											
144 1234-TETRAHYDRONAPTHALENE																			
145 1,4-DIISOPROPYLBENZENE																			
146 DODECANE	1.86	10.21	13.31	10.15	5.84		40.25	20.32	2.06				1.84		5.19		2.80	2.68	4.44
Total Compounds Identified	41	47	50	65	61	59	57	60	42	25	53	53	41	55	39	27	36	19	30
Total # of Peaks	60	83	97	141	115	121	99	96	69	33	82	85	54	84	50	33	46	28	36
Total Area of Peaks	29474.07	35202.00	33020.09	68363.54	79161.91	109100.2	55932.33	41993.08	21938.42	8401.93	22872.45	27833.03	23277.59	37533.44	4273.56	3544.35	4475.60	1856.57	2713.99
Area of Identified Peaks	25117.54	27394.97	25945.10	54296.67	72314.39	96766.82	46768.56	32913.35	13822.35	4365.92	20253.90	24027.38	19680.71	31897.50	3330.66	2939.95	3611.11	1245.45	2221.88
Area % Identified Peaks	85	78	79	79	91	89	84	78	63	52	89	86	85	85	78	83	81	67	82
Total Hydrocarbons ug/m3	67.4	181.69	135.59	600.29	3710.35	4741.1	2344.31	2592.77	274.36	46.22	441.88	570.61	57.85	265.61	163.29	133.14	114.27	40.88	73.67
Alkanes ug/m3	39.47	96.47	74.31	351.63	2103.07	2444.48	831.93	595.41	205.58	29.02	144.58	127.62	33.51	190.96	105.18	100.16	73.97	32.95	53.34
Cycloalkanes ug/m3	6.94	16.1	8.27	47.69	133.18	340.03	79.99	63.59	20.35	4.69	26.44	37.8	3.94	14.9	11.37	4.62	7.2	0.59	2.97
Alkenes ug/m3	1.68	5.07	3.05	34.38	211.75	224.88	84.94	78.05	21.69	1.42	11.14	7.42	3.37	21.52	5.89	3.87	1.96	0	2.75
Cycloalkenes ug/m3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

LOCATION	LEES AVENUE STATION PROPERTY				NAVRO FENCELINE		LEES AVENUE OPEN MANHOLE		SCHOOLYARD NEAR NAVRO		NAVRO - AT ROAD		ALG.COLL. PARK. LOT	190 LEES FRONT LOT	LEES AVENUE STATION ELEVATOR AREA				
															E.SHAFT	W.SHAFT	TOP E.ELEV	E STAIRS	W STAIRS
MAP I.D.	1	1	1	2	7	7	3	3	4	4	5	6	8	9	10	11	10	10	11
	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986	1986
	MAY 31	MAY 31	MAY 31	MAY 31	MAY 31	MAY 31	JUN 1	JUN 1	JUN 1	JUN 1	JUN 1	JUN 1	JUN 2	JUN 2	JUN 2	JUN 2	JUN 3	JUN 3	JUN 3
	12:25	13:34	14:45	16:02	18:24	18:58	12:12	13:02	15:12	16:11	17:02	17:58	12:14	14:54	16:13	16:56	15:51	16:53	17:30
Alkynes ug/m3	0	0.29	0	0.38	0	0	0	2.14	0	0	0	0	0	0	0	0	0	0	0
Aromatics ug/m3	19.31	63.76	49.96	151.68	1158.35	1443.43	1337.01	1853.58	26.74	11.09	201.98	304.75	17.03	37.43	40.85	24.49	31.14	7.34	14.61
Chlorinated Alkanes ug/m3	0	0	0	4.76	104	277.06	10.44	0	0	0	47.82	72.39	0	0.8	0	0	0	0	0
Chlorinated Alkenes ug/m3	0	0	0	0	0	11.22	0	0	0	0	9.92	20.63	0	0	0	0	0	0	0
Chlorinated Aromatics ug/m3	0	0	0	9.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene:Ethylbenzene	3.3	13.0	1.9	12.5	0.9	2.0	6.2	6.2	5.8		0.3	0.1	2.7	3.3	2.0	2.7	2.0		2.6
Toluene:Ethylbenzene	4.9	3.2	3.3	4.0	14.2	7.4	6.2	5.2	5.5		6.5	5.2	4.7	5.1	5.2	5.8	15.4		5.3
Xylenes:Ethylbenzene	4.4	3.7	3.2	4.4	4.1	4.0	3.9	3.5	4.3		3.8	3.8	4.3	4.2	4.5	4.3	4.2		4.3

OTTAWA SEQ. SAMPLER DATA 30 MINUTE SAMPLES

OTTAWA GC DATA OF SEPT.4,1986 SAMPLES
LOCATIONS: LEES AVE. APT. BUILDINGS; LEES AVE. PUMPING STATION; NAVRO SITE ON NAVAN RD.

LOCATION	169 LEES		170 LEES		180 LEES		190 LEES		PUMP STATION		NAVRO SITE	
SAMPLE START TIME	16:15	16:45	16:48	17:18	17:45	18:15	18:35	19:05	19:30	20:00	21:08	20:38
1 PROPANE					56.00	35.00	11.19					5.58
2 PROPADIENE												
3 PROPYNE												
4 CHLOROMETHANE												
5 CYCLOPROPANE												
6 2-METHYLPROPANE	14.72				79.16	93.9	67.48	74.11				
7 CHLOROETHENE												
8 2-CHLORO-2METHYLPROPANE						27.72						
9 1-BUTENE					17.17	16.56	6.47	6.26				
10 1,3-BUTADIENE												
11 BUTANE					256.98	293.17	196.53	233.45				
12 1-BUTYNE												
13 CHLOROETHANE												
14 3-METHYL-1-BUTENE						8.6						
15 2-METHYLBUTANE	6.68				400.57	380	220.29	247.4			4.25	6.52
16 PENTANE					265	233.33	105.53	132.5			24.94	38.55
17 2-METHYL-1,3-BUTADIENE												
18 trans-2-PENTENE					29.99	28.41	14.85	15.87				
19 cis-2-PENTENE					19.15	17.71						
20 DICHLOROMETHANE												
21 2-METHYL-2-BUTENE					56.23	53.73	29.5	34				
22 3-CHLOROPROPENE												
23 2,2-DIMETHYLBUTANE					14.79	13.49	7.8	9.32				
24 trans-1,2-DICHLOROETHENE												
25 4-METHYL-1-PENTENE												
26 3-METHYL-1-PENTENE												
27 CYCLOPENTANE							10.5	12.35				
28 2,3-DIMETHYLBUTANE							16.72	20.54				
29 2-METHYLPENTANE	8.52	4.71			150.86	130.76	70.65	90.19				5.51
30 3-METHYLPENTANE	7.45	4.02			90.24	79.01						4.21
31 1-HEXENE					6.32							
32 cis-1,2-DICHLOROETHENE												
33 2-CHLOROBUTANE												
34 HEXANE	15.51	7.74			133.58	126.81	52.58	101.01				10.54
35 TRICHLOROMETHANE												
36 trans-3-HEXENE					7.36	6.4		5.15				
37 3-CHLORO-2-METHYLPROPENE					11.6	9.19						
38 METHYLCYCLOPENTANE					55.21	49.26	23.4	33.35				
39 1,2-DICHLOROETHANE												
40 1,1,1-TRICHLOROETHANE	53.16	25.96										
41 1-CHLOROBUTANE												
42 BENZENE				4.83	92.69	75.73						
43 TETRACHLOROMETHANE												
44 CYCLOHEXANE					12.99	11.94	5.73	7.23				
45 2,3-DIMETHYLPENTANE		4.6			59.36	58.44	31.28	39.19				10.81
46 2-METHYLHEXANE	9.51	4.87			62.61	61.71	33.07	41.41				11.41
47 CYCLOHEXENE												
48 DIBROMOMETHANE												

OTTAWA SEQ. SAMPLER DATA 30 MINUTE SAMPLES

OTTAWA GC DATA OF SEPT.4,1986 SAMPLES
LOCATIONS: LEES AVE. APT. BUILDINGS; LEES AVE. PUMPING STATION; NAVRO SITE ON NAVAN RD.

	LOCATION	169 LEES		170 LEES		180 LEES		190 LEES		PUMP STATION		NAVRO SITE	
	SAMPLE START TIME	16:15	16:45	16:48	17:18	17:45	18:15	18:35	19:05	19:30	20:00	21:08	20:38
49	1,2-DICHLOROPROPANE												
50	3-METHYLHEXANE	8.43	4.3			47.86	51.93	22.47	29.23				11.28
51	2,3-DICHLOROPROPANE					9.92							
52	TRICHLOROETHENE												
53	2,2,4-TRIMETHYLPENTANE					50.5	22.79	27.25	34.32			3.57	63.14
54	1-HEPTENE												
55	HEPTANE	10.2	4.62	6.76		71.9	103.55	18.9	53.39				35.34
56	trans-2-HEPTENE					5.27							
57	METHYLCYCLOHEXANE												
58	4-METHYLCYCLOHEXENE					4.93							
59	2,5-DIMETHYLHEXANE					14.06	6.36		5.96				18.95
60	1-CHLOROPENTANE												
61	1,1,2-TRICHLOROETHANE												
62	TOLUENE			5.7	5.16	257.44	207.8	120.27	176.14	7.75	10.5	6.53	28.94
63	1,3-DICHLOROPROPANE												
64	2-METHYLHEPTANE					13.14	10.34		7.48				
65	4-METHYLHEPTANE					10.45	7.62	3.73	7.27				
66	3-METHYLHEPTANE					22.45	18.24	9.37	13.55				
67	1,2-DIBROMOETHANE												
68	1-OCTENE												
69	trans12DIMETHYLCYCLOHEXAN												
70	trans-4-OCTENE												
71	TETRACHLOROETHENE												
72	OCTANE					26.86	19.15	8.86	17.25				6.22
73	trans-2-OCTENE												
74	cis12DIMETHYLCYCLOHEXANE												
75	CHLOROBENZENE												
76	ETHYLCYCLOHEXANE												
77	1-CHLOROHEXANE												
78	ETHYLBENZENE	8.21				54.13	44.94	22.79	31.03				4.33
79	m-XYLENE & p-XYLENE	35	13.87		3.98	198.62	160.81	71.83	96.4	4.48	4.89	7.36	9.93
80	p-XYLENE												
81	4-METHYLOCTANE												
82	2-METHYLOCTANE	7.3				11.2	8.83						
83	3-METHYLOCTANE	15.67	10.82		2.83	12.72	11.38	5.8	9.31				
84	STYRENE	20.33	17.29		7.45	9.65	9.87	6.54	9.84				
85	1,4-DICHLOROBUTANE												
86	o-XYLENE	19.57	6.14			78.03	62.03		36.16				3.66
87	1,1,2,2-TETRACHLOROETHANE												
88	1,2,3-TRICHLOROPROPANE												
89	1-NONENE	4.14											
90	trans-1,4-DICL-2-BUTENE												
91	NONANE					25.96	20.39	6.06	6.73				7.57
92	ISOPROPYLBENZENE	11.4				3.83	4.51						
93	2-CHLOROTOLUENE					8.5	7.97						
94	3-CHLOROTOLUENE		15.21										
95	4-CHLOROTOLUENE		43.34			9.39	7.21		7.03				
96	PROPYLBENZENE	130.94	12.02			26.08	20.37	7.15	9.02				
97	3-ETHYLTOLUENE		47.32			83.44	64.22	16.37	32.07				6.37

OTTAWA GC DATA OF SEPT.4,1986 SAMPLES
LOCATIONS: LEES AVE. APT. BUILDINGS; LEES AVE. PUMPING STATION; NAVRO SITE ON NAVAN RD.

LOCATION	169 LEES		170 LEES		180 LEES		190 LEES		PUMP STATION		NAVRO SITE	
SAMPLE START TIME	16:15	16:45	16:48	17:18	17:45	18:15	18:35	19:05	19:30	20:00	21:08	20:38
98 4-ETHYLTOLUENE	177.5	19.4			30.96	24.36						
99 1,3,5-TRIMETHYLBENZENE	130.74	54.74			44.33							
100 2-ETHYLTOLUENE		18.22										3.87
101 tert.BUTYLBENZENE							23.81	32.68			2.63	4.5
102 1,2,4-TRIMETHYLBENZENE		80.72			160.32	125.57		62.83				
103 tert.BUTYLCYCLOHEXANE												
104 1,3-DICHLOROBENZENE												
105 (CHLOROMETHYL)BENZENE	35.07	19.12										
106 1-DECENE												
107 1,5-DICHLOROPENTANE	20.15											
108 isoBUTYLBENZENE	20.87	5.09				3.11		3.04				
109 sec.BUTYLBENZENE												
110 DECANE					30.49						12.6	29.47
111 3-(CHLOROMETHYL)HEPTANE												
112 1,2,3-TRIMETHYLBENZENE		34.9										
113 1ISOPROPYL4METHYLBENZENE	21.46	12.24										
114 1,2-DICHLOROBENZENE		9.53										
115 INDAN	23.93	10.12										
116 BUTYLCYCLOHEXANE	40.18											
117 1,3-DIETHYLBENZENE	18.04											
118 1,4-DIETHYLBENZENE		11.11										
119 BUTYLBENZENE					21.25	19.24	6.61	8.75				
120 1,2-DIETHYLBENZENE												
121 transDECAHYDRONAPHTHALENE	18.2							4.18				
122 cis-DECAHYDRONAPHTHALENE												
123 UNDECANE	115.44	50.21			32.16	20.72	8.86	18.04			9.69	34.24
124 1235-TETRAMETHYLBENZENE	6.32	7.89										
125 1234-TETRAMETHYLBENZENE												
126 1234TETRAHYDRONAPHTHALENE												
127 1,4-DIISOPROPYLBENZENE												
128 DODECANE	8.21				11.85	7.21						
Total Compounds Identified	31	29	2	5	52	49	34	41	2	2	8	23
Total # of Peaks	99	80	3	6	116	110	68	87	5	5	12	45
Total Area of Peaks	71207.46	21514.69	227.39	595.79	52762.82	47655.02	21813.99	29473.48	383.485	495.92	1178.575	7305.17
Area of Identified Peaks	20443.71	7487.265	143.945	314.04	41193.50	36608.32	16767.43	22369.58	170.06	213.09	956.695	4250.015
Area % Identified Peaks	28.71006	34.80071	63.30313	52.70984	78.07297	76.81944	76.86549	75.89730	44.34593	42.96862	81.17387	58.17818
Total Hydrocarbons ug/m3	1022.85	560.12	12.46	24.25	3265.55	2881.39	1290.24	1815.03	12.23	15.39	71.57	360.94
Alkanes ug/m3	227.64	95.89	6.76	2.83	1957.07	1814.13	924.42	1191.65	0.00	0.00	55.05	299.34
Cycloalkanes ug/m3	40.18	0.00	0.00	0.00	68.20	61.20	39.63	52.93	0.00	0.00	0.00	0.00
Alkenes ug/m3	4.14	0.00	0.00	0.00	141.49	131.41	50.82	61.28	0.00	0.00	0.00	0.00
Cycloalkenes ug/m3	0.00	0.00	0.00	0.00	4.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aromatics ug/m3	642.51	351.07	5.70	21.42	1060.77	822.56	275.37	502.14	12.23	15.39	16.52	61.60
Chlorinated Alkanes ug/m3	73.31	25.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chlorinated Alkenes ug/m3	0.00	0.00	0.00	0.00	21.52	9.19	0.00	0.00	0.00	0.00	0.00	0.00
Chlorinated Aromatics ug/m3	35.07	87.20	0.00	0.00	17.89	15.18	0.00	7.03	0.00	0.00	0.00	0.00

OTTAWA SEQ. SAMPLER DATA 30 MINUTE SAMPLES

OTTAWA GC DATA OF SEPT.4,1986 SAMPLES
LOCATIONS: LEES AVE. APT. BUILDINGS; LEES AVE. PUMPING STATION; NAVRO SITE ON NAVAN RD.

LOCATION	169 LEES		170 LEES		180 LEES		190 LEES		PUMP STATION		NAVRO SITE	
SAMPLE START TIME	16:15	16:45	16:48	17:18	17:45	18:15	18:35	19:05	19:30	20:00	21:08	20:38
Benzene:Ethylbenzene	0.00				1.71	1.69	0.00	0.00				0.00
Toluene:Ethylbenzene	0.00				4.76	4.62	5.28	5.68				6.68
Xylenes:Ethylbenzene	6.65				5.11	4.96	3.15	4.27				3.14